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ABSTRACT

Increased educational resources at home and at school will improve student achievement, according to this study of third graders' reading and math scores in 384 New York State public schools. The factors tested included the school environment (teachers' years of experience and amount of graduate training, school size, the student-teacher ratio, the percentage of minority students, and expenditures per student) and the home environment (indicated by the school-district population's median years of schooling and percentage living below the poverty line). Schools studied were in New York City, upstate cities, and suburban and rural areas. Achievement test scores showed positive statistical associations with the schools' level of teacher experience and expenditure per student, and a negative association with schools' percentage of minority students. Achievement scores showed stronger associations with home influences--a positive one with the population's years of schooling and a negative one with percentage below poverty. Rural schools had higher achievement scores than expected. The study concludes that additional financing for schools with low expenditures per student will raise achievement levels. Further research is needed to identify home conditions most easily influenced by schools and the factors responsible for rural schools' superior performance. (RW)

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Working Paper No. 27

THE RELATIONSHIP OF EDUCATION RESOURCES TO STUDENT ACHIEVEMENT LEVELS IN NEW YORK STATE

by

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April 1980

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EXECUTIVE SUMMARY

Do schools make a difference? This has been a burning question in education for the past two decades. A popular method of assessing what matters to education achievement is the input-output model. According to this model, education inputs, such as expenditures per child, average teacher experience and education level, peer group influences and home background are associated with education outputs, such as reading and/or math scores, through a "black box" mechanism.

This document addresses the question of whether variations in education inputs (resources) among schools make a difference in the average achievement of third grade students in schools in New York State. The results indicate that both average third grade reading and mathematics achievement levels are associated with school resources such as the average years of teacher experience, approved operating expenditures per child and instructional expenditures per child. Home resources, however, as measured by median years of schooling of the population and percent of the population below poverty level income, generally have the strongest influence on student achievement levels. Percent minority, which is entered as a control for a myriad of effects such as English as a second language, cultural differences and possible transiency among schools, is negatively associated with achievement levels.

This research is encouraging and thought provoking. The positive association between school resources and achievement is encouraging. The thought provoking aspect is that rural schools

are doing something different because they appear to be achieving more than would be expected given their resources. These findings also generate a number of policy implications. They are:

- Schools do make a difference, therefore, a school finance program that distributes additional funds to low spending school districts should lead to a general increase in achievement.
- Rural schools are different, or they are doing things differently. Therefore, rural schools need to be the subject of more intensive investigation.
- Schools may want to identify home factors which are susceptible to influence from the schools since home background is the most important determinant of achievement levels.
- Although race is associated with low achievement levels, other studies have demonstrated that minority students tend to display the same growth in achievement and to respond to cues in the same way as other students. Therefore, school systems should focus on those factors most successful in improving test scores for minority students.

INTRODUCTION

> There is conclusive evidence that differences among schools and teachers are important in achievement. Schools simply do not have homogeneous impacts on students. Yet, the identification and measurement of specific teacher or school attributes which are important is much less certain (Hanushek, 1979, p.377).

Since the publication of the Coleman Report (1966) one of the most controversial questions raised in education has been: Do schools make a difference? Related questions have included: Will greater expenditures improve the quality of education? Are better educated and more experienced teachers also more effective teachers? Does a better physical plant enhance the learning environment? During the past 14 years, models addressing the above questions have been developed, refined, repeated and modified.

A popular method of assessing what matters to education achievement is the input-output model. Education inputs, such as expenditures per child, teacher education levels and accumulated years of experience, pupil-teacher ratios and peer group influences, are related to education outputs, such as student achievement test scores. Inputs are assumed to influence outputs through a "black box" mechanism.[1]

The popularity of research on student achievement lies deeper

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[1]More recent research efforts have concentrated on getting inside the black box. Time on task measurements and identification of learning processes are examples of this thrust.

than just wanting to know "what helps Johnny learn to read." Public services like education are difficult to define. The input-output framework clarifies relationships between factors and provides an estimate of the magnitude of the relationships. In the competition for public monies, the effectiveness of the additional dollars is becoming an issue of increasingly greater importance.[2]

This paper addresses the question of whether variations in education resources among schools make a difference in the average achievement of the students in schools in New York State. Specifically, average third grade reading and math scores in a sample of over 1,000 public elementary schools in New York State will be related to levels of education resources, peer group influences and community socioeconomic characteristics. The results will measure the reliability and magnitude of association, but not necessarily affirm causal influences. Furthermore, this study will not determine how resources should be allocated among and within classrooms. That is a much more ambitious effort than the research conducted here.

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[2]The fundamental questions addressed by the input-output framework are: Which resources devoted to education do make a difference and what is the amount of that difference? It does not provide any information about how those resources should be provided within a school or classroom, although some breakthroughs are being made in the more recent research mentioned in footnote 1. Moreover, this leads to the additional point that resource equalization among districts does not necessarily ensure that all students within the district will receive the same amount of resources.

RESULTS OF OTHER RESEARCH

The impact of variations in education resources in schools on student achievement has received a substantial amount of attention. For example, the 1972 report by Averch et al., How Effective Is Schooling?, reviewed 19 studies that fit into the input-output framework.[3]

Research interest on this topic has not abated since then as researchers have refined the models and techniques and have sought the perfect data set. A number of the more significant studies are summarized below and the findings of interest are listed in Table 1.

This table is presented to show some of the factors which have been investigated. If the space is blank, the particular researcher did not look at that variable. A "+" or "-" notation indicates that it was investigated and the direction of the effect that was found. Many of these variables were found to be significant only for specified subgroups. For example, some student groups were categorized by race, income and achievement levels. Therefore, general statements on the basis of the results summarized in Table 1 should be made with extreme caution.

Hanushek (1968) studied differences in the education of white students and black students using 713 schools which varied in racial composition. His outcome measure was the average verbal

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[3]They also reviewed studies that employed alternative frameworks such as the process approach, the organizational approach, the experiential approach and broad education intervention.

Table 1

SUMMARY OF FINDINGS RELATED TO STUDENT ACHIEVEMENT

	Hanushek (1968)	Hanushek (1970)	Murnane (1975)	Brown & Saks (1975)	Summers & Wolfe (1977)
Level of Analysis[a]	school	individual student	individual student	school district	individual
Achievement Measure[b]	level	level/ value added	value added	level	value added
Home Background	+		+	+	+**
Teacher Experience	+		+*	+	-*
Teacher Degree Status		+*		+	
Teacher Verbal Ability		+*			
Race	-*				+**
Peer Group				+	+*

[a]Level of analysis refers to the achievement measured, such as school district average, school average or the score of the individual student.

[b]Achievement measure refers to whether the actual achievement level or the change in the achievement level over time (value added) was the subject of analysis.

*Only effective for specified subgroups

**These variables were interpreted separately and in combination with other variables.

score for the school. Calculating the effect of education resources separately for students in predominantly white schools and black schools, he determined that both teacher's verbal score and teacher's experience were associated with higher verbal scores in white and black schools.

Hanushek (1970) followed the above study with one in which he used data on individual children. He accounted for differences in the family background of the student and peer group influences as well as the inputs of the school -- such as teacher quality. Hanushek determined that the factors measuring the characteristics of teachers, such as experience and advanced training, for both second and third grade teachers had no impact on third grade achievement of white students. However, greater verbal facility of the third grade teacher was associated with greater third grade achievement for white students whose father had a manual occupation.

Murnane (1975) also studied this topic but modified the approach by measuring the influence of different school resources on the "value added" (the change in a year's time period) in the reading and math scores of individual students. Two features of Murnane's study worth noting are that he matched up detailed information on the individual classroom teacher with each student and that all the children were of the same race and attended schools in the same system. Among Murnane's findings were the following:

- Children's reading achievement is more highly influenced by their background and prior experiences than is their math achievement (p. 77).
- Teachers have a critical impact on student achievement (p. 77).
- The effectiveness of teachers increases dramatically in the first few years of teaching, reaching a peak in the third to fifth year. There is no systematic relationship between experience and performance for teachers with more than five years of experience (p. 78).
- Black teachers with less than six years of experience are on average more successful in teaching reading to black children than are white teachers with similar experience levels (p. 78).
- A high rate of student turnover in a class has a deleterious effect on children's reading achievement. The effect is greatest or children who start the year with relatively high reading achievement (p. 78).

Brown and Saks (1975) reversed the trend of using data on individual students and instead used school district level information. They defined two outcomes for the school district: the school district average of the combined test scores for reading, mathematics and the mechanics of written English for fourth grade students in the state of Michigan, and the standard deviation of the test score. This second outcome measures how widely individual student test scores are spread around the school district average. They hypothesized that school resources are effective if they either raise student achievement or reduce the standard deviation of achievement.

They determined that the average experience of the instructional staff is associated with higher average achievement scores in suburban and rural schools and the percent of the school district's teachers with a master's degree is associated with

higher average achievement scores in rural school districts. In both instances, the experience level of the instructional staff is related to a reduction in the standard deviation, thereby indicating that this education resource improved the scores of low achieving students more than improving the scores of the better students.

Summers and Wolfe (1977) typify what might be called the positive school of education input-output studies because they have been willing to state that while much is unknown about how the process of learning takes place, it is still possible to identify factors which are associated with improved outcomes. Like Hanushek and Murnane, they utilized pupil specific information, and also collected the pupil's education history over a three year period. In addition, they gathered data on school resources, family income and teacher characteristics in an attempt to isolate the influence of these factors on the "value added" to achievement test scores over a number of years.

Their results indicated that some school inputs add significantly to achievement but that separate subgroups are affected differently by various resources. They found, for example, that when they controlled for the interaction of race and income with school inputs, variations in the achievement growth of individual students was not influenced either by the race or the family income of the student.[4] Sex and first grade I.Q. both

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[4]Link and Ratledge (1974) cite an interesting study that may help to explain the achievement level-race nexus. They wrote:

affect achievement, as did motivation (represented by unexcused absences and lateness). Teachers from better undergraduate schools have more influence on achievement growth but more experienced teachers only have positive effects for students with high scores. Low achieving students are negatively affected by these teachers.

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[4](continued)
Robert Rosenthal and Lenore Jacobson have presented evidence which suggests that one person's expectations about another's behavior may serve as a self-fulfilling prophecy. In their experiment, they administered a standard nonverbal IQ test during the spring of 1964 to all students of a single school district. In the following fall, teachers were given a list of names of students who could, on the basis of the IQ test, be expected to show dramatic intellectual achievement during the coming year. In reality, the names of these "bloomers" were chosen from a table of random numbers. Thus, the difference between "bloomers" and "nonbloomers" (the control group) in each classroom was in the mind of the teacher.

Rosenthal and Jacobson's main concern involved whether or not those who were thought to be brighter by their teachers would become brighter because of their teacher's belief (i.e., self-fulfilling prophecy). Evidence reported suggests that "bloomers'" gains in IQ scores and reading achievement exceeded those in the control group. Also, teacher expectations seem to be subject to change. Even the "bloomers" from minority groups and low socioeconomic backgrounds, students whom teachers tend to stereotype as low achievers, were viewed more favorably by their teachers than their counterparts in the control group. If teachers' expectations can be changed, and these expectations lead to greater achievement, as suggested by Rosenthal and Jacobson, one would expect that the student's perception of what the teacher thinks of him would be changeable (pp. 103-104).

Summers and Wolfe summarized their conclusions in this way:

> The findings of this study suggest (1) that when there are extensive pupil-specific data available, more impact from school inputs is revealed; (2) that when the effects of school inputs are examined differentially, more impact and insight emerge; (3) that most of the effects of family income and race can be tagged to some specific school inputs and (4) that the low achiever, the low income student, and the black student do respond in terms of achievement growth to some school inputs (p. 649).

Although the scope of this project does not permit us to utilize the new directions in input-output research, several examples are discussed to suggest the extent of current input-output work. New directions in input-output research involve different kinds of factors on both the input and output sides. This is in answer to a new set of questions: How do children learn? What kinds of changes in learning take place? Which input variables are susceptible to change, either before or during the learning process? The outcome to be measured may now be learning rather than a change in test scores. The emphasis is on process rather than static variables.

In isolating new inputs the focus shifts to the classroom. Within the classroom the various actors are identified as decision makers. Teachers, students, and even parents, make continuous decisions about how to use their time. Thus time use becomes a variable. For example, for the individual student, the time on task, or actual time spent in learning is of interest. Her/his learning patterns are important.

The technology of teaching is observed. This includes behaviorial elements of instruction such as cues, participation

and reinforcement. Specific techniques -- like determining "cognitive entry," the skills prerequisite to learning a new skill or "summative testing," giving students feedback on the extent of their learning -- are also inputs (Bloom, 1980).

Since home environment has consistently been shown to have impact on student achievement, research may be directed toward identifying which elements in the home environment are subject to modification in response to outside influences.

Methods of research may change from accumulating written data on teacher, student and school characteristics to direct observation in the classroom, counting time spent in specific activities and personal interviews.

FACTORS ASSOCIATED WITH EDUCATION ACHIEVEMENT

The purpose of this study is to measure the association between education inputs and education outputs for third grade students in New York State. The data set -- which is based on the Consolidated Data Base of the State Education Department's Basic Educational Data System (BEDS) -- has been edited so that the sets of schools studied are as homogeneous as possible except for the variations in the specific education inputs under consideration. As a result, the only schools used are public elementary schools in which the highest grade is the sixth grade and which have valid information on both the education inputs and outputs.

The education inputs included in the analyses are the following:

- Average experience of the teaching staff of the school
- Average percent of the teaching staff of the school having earned a master's degree or greater
- Pupil-teacher ratio of the school
- Number of students in the school (size)
- Percent of the school's student body classified as minority
- Approved operating expenditures per pupil in the school district measured in nominal, real and natural logarithmic values
- Total instructional expenditures per pupil in the school district measured in nominal and real values
- Median years of schooling of the population living in the school district
- Percent of the population in the school district below the poverty income level.

Values for 1970 are used for the last two factors, but figures for the 1977-78 school year are used for all other input factors. The education outputs, which also are the values for the 1977-78 school year, are the following:

- Average third grade reading score for the school
- Average third grade mathematics score for the school.

The theory behind the association of these inputs to education performance is straightforward. One fact must be kept in mind, though, as the relationships are described. The attributes of teachers -- experience and degree status -- are proxy measures for what is thought to make an effective teacher. Presumably, experience and degree status measure knowledge of teaching methods and subject matter, and the ability to search out quickly and utilize the most effective methods for the particular set of students in the classroom. If the analysis does not reveal a reliable association, it is not prima facia evidence that teachers with these qualities are not better teachers, rather it indicates that these proxies may not be the appropriate ones, and the researcher should investigate other measurable attributes.

The school characteristics are size (number of students) and pupil-teacher ratio. Smaller schools may tend to permit more contact between teachers and students outside of the classroom and more informality, which could lead to a more conducive learning environment. Smaller schools also could reflect fewer special classes and other education offerings and may be associated with lower achievement. Fewer pupils per teacher should permit more

contact on average in the classroom so that the student is receiving more resources.

It is expected that the correlation between race and achievement test scores will be negative: that as the percent of minority students in a school increases, the average test score will fall. The phenomenon of low scores for minority children has received a large amount of attention and has been the subject of a diverse range of theories. The variables included in this study do not allow any definite statement on why this occurs. There are many possible explanations. Part of the cause may be cultural bias in the test itself. In an input-output context, this result may be attributed to elements in any of the groups of input variables such as teacher training or techniques, curriculum, or physical facilities in the schools. Since home background has, in past research, been consistently shown to be the most important determinant of a child's educational achievement, factors present in minority homes ranging from low aspirations to alienation from the school system could lead to achievement variations.

The child's peers may account for some of this finding. For example, much research has attempted to measure the impact on a child of being in a class of low achieving students. Murnane (1980) has summarized some of the research on this topic. For example, "elementary school children from low SES families who attend schools with a high proportion of high SES students make more progress than children who attend schools in which most of the children come from low SES families (p. 8)." Furthermore, he reports that "both black and white students who attend schools in

which the racial composition is in the 40-60% range make more progress than students in schools that are more segregated by race (p. 7)." Therefore, a lower initial level of home resources combined with large concentrations of students with similar backgrounds may result in a substantially lower level of achievement.

Expenditures per student, both approved and instructional, measure the flow of resources to schools in that district. The greater the expenditures, the greater the expected achievement. This supposition has been one of the important elements in school finance cases. Specifically, greater expenditures (resources) are usually indicative of a better quality education.

The measures of socioeconomic status, median years of schooling of the population and percent of population below poverty, represent the home and community environment for education. Greater median years of schooling of the population is expected to reflect a greater interest in education and more resources for education in the home, particularly for reading development. Percent below poverty reflects some of the same attributes but in the opposite direction. Furthermore, it also may be a negative indicator of the community's effort and ability to provide education resources outside of the school -- such as libraries and summer activities.

In summary, on average it is expected that there will be positive associations between education achievement and the quality of the teaching staff, approved expenditures per child and instructional expenditures per child and the median years of

schooling of the population. Negative associations are expected between education achievement and the pupil-teacher ratio, the percent of the population below the poverty level and percent minority. The association with number of students in the school is ambiguous.

RESULTS OF THE MEASURE OF ASSOCIATION BETWEEN EDUCATION INPUTS AND OUTPUTS

In general, the results of the statistical analysis conform to expectations. Greater teacher quality, as measured by the proxies described herein, tends to be associated with greater education achievement. The same holds for both approved operating expenditures per pupil and instructional expenditures per pupil. In almost all instances, percent below poverty income and higher percent minority are related to lower achievement, and median years of schooling is associated with higher achievement. In some instances, school size is associated with education achievement, but the direction of the relation changes. The pupil-teacher ratio also is associated with greater education achievement, although the expectation was that it would be associated with lower achievement. The results for reading achievement are summarized in Table 2 and for math achievement in Table 3. The actual statistical results are reported in the Tables in the Appendix.[5]

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[5]Tables 2 and 3 follow much the same format as Table 1 and reflect only the findings reported in the Appendix. A "+" indicates that the association is positive and statistically reliable in at least 50 percent of the analyses. A "-" indicates that the association is negative and statistically reliable in at least 50 percent of the analyses. A "0" indicates no reliable association in at least one-half of the cases. Statistical reliability is defined as 90 percent confidence in the association. If the value in parentheses for the factors on the Tables in the Appendix is equal to or greater than 1.645, the association is statistically reliable.

As can be noted from the tables, the associations between inputs and achievement are quite similar for both reading and math. One exception to the above is for rural schools. On average, size of the school is associated with higher reading achievement but not with math achievement. A higher pupil-teacher ratio is not associated with reading achievement but is related to higher math achievement. Finally, percent below poverty income is not associated with the average math score, but it is related to lower average reading scores.

Increased average experience of teachers and percent of the teachers with a master's degree or greater are associated with higher reading achievement in most of the analyses. For example, in the statewide sample of schools, if the average education experience of the staff increases by one year, the average reading score would be expected to increase by .158 points, going from 30.05 to 30.21. An increase of the faculty with a master's degree or more would be associated with reading scores improving by .01. However, a note of caution must be included because the positive association between experience and achievement may reflect only that and not causality. In fact, any causality may be in the opposite direction. Specifically, seniority provisions in collective bargaining agreements generally permit senior (most experienced) staff to select the school in which they would like to teach. One of the factors attracting more senior teachers to a certain school may be the general quality of the school as

Table 2

A SUMMARY OF THE ASSOCIATIONS WITH
THIRD GRADE READING ACHIEVEMENT

School Group	State Sample Schools	Rural Schools	Downstate Schools	Upstate Noncity Schools	Upstate Metro Schools
Variables					
Teacher Characteristics:					
Average Experience	+	+	+	+	+
Percent MA or Greater	+	0	+	0	0
School Characteristics:					
Percent Minority	-	-	-	-	-
Size	0	+	-	0	0
Pupil-Teacher Ratio	+	0	+	0	0
Approved Expenditures:					
Log(e) Per Pupil	+				
Nominal Per Pupil	+				
Real Per Pupil	+	+	+	+	0
Instruction Expenditures:					
Nominal Per Pupil	+				
Real Per Pupil	+	+	+	+	0
Socioeconomic Status:					
Median Years Schooling	+	0	+	+	+
Percent Below Poverty	-	-	0	-	-
Regional Characteristics:					
New York City Schools	0		-		
Upstate City Schools	-				0
Suburban Schools	X				
Rural Schools	-			0	
Upstate Schools				X	X
Downstate Schools			X		

KEY:
+ signifies statistically reliable positive associations in at least one-half of the analyses.
- signifies statistically reliable negative associations in at least one-half of the analyses.
0 signifies no statistically reliable associations in at least one-half of the analyses.
X represents the subgroup of schools against which the regional group is compared.

Table 3

A SUMMARY OF THE ASSOCIATIONS WITH
THIRD GRADE MATH ACHIEVEMENT

School Group	State Sample Schools	Rural Schools	Downstate Schools	Upstate Noncity Schools	Upstate Metro Schools
Variables					
Teacher Characteristics:					
Average Experience	+	+	+	+	+
Percent MA or Greater	+	0	+	0	0
School Characteristics:					
Percent Minority	-	-	-	-	-
Size	0	0	-	0	-
Pupil-Teacher Ratio	+	+	+	0	0
Approved Expenditures:					
Log(e) Per Pupil	+				
Nominal Per Pupil	+				
Real Per Pupil	+	+	+	+	0
Instruction Expenditures:					
Nominal Per Pupil	+				
Real Per Pupil	+	+	+	+	0
Socioeconomic Status:					
Median Years Schooling	+	0	+	+	+
Percent Below Poverty	-	0	0	-	-
Regional Characteristics:					
New York City Schools	-		-		
Upstate City Schools	-				-
Suburban Schools	X				
Rural Schools	-			-	
Upstate Schools				X	X
Downstate Schools			X		

KEY:
+ signifies statistically reliable positive associations in at least one-half of the analyses.
- signifies statistically reliable negative associations in at least one-half of the analyses.
0 signifies no statistically reliable associations in at least one-half of the analyses.
X represents the subgroup of schools against which the regional group is compared.

measured by the achievement of its students.[6] Thus, more experienced teachers may be located in schools with higher achieving students.

Further insight into the experience-achievement relationship is provided by inspecting the results for just the rural schools. The possibility mentioned above may be more a phenomenon of city school districts which serve widely varying student populations and these variations may be reflected in neighborhood schools. It is expected that schools within a rural school district would tend to be more homogeneous and that movement among schools as seniority increases would be less in response to achievement variations. Furthermore, there may be no more than one elementary school in a rural district. The results for just rural schools (see Tables A-3 and A-9) indicate that increased experience is associated positively with higher achievement such that an additional year of experience of the staff results in an increase in test scores of .209 points.

Approved operating expenditures per pupil (either natural logarithm, nominal or real value) are included in a number of the analyses. Greater expenditures per pupil are associated with greater levels of reading achievement in all results except for those of the upstate metropolitan schools. The implication of this relationship for the statewide sample of schools is that a one dollar increase in expenditures per student would mean a .001 increase in reading

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[6]The net effect of experience on achievement can be determined through a more complex statistical procedure. The computer software requirements are rather sophisticated, however.

achievement. An alternative way of stating this is that an increase in expenditures per pupil of $1000 would be required to raise the average test score by one point. For rural schools, a $500 increase would raise average reading scores by one point.

Related to the above is the question of whether approved operating expenditures per pupil or instructional expenditures per pupil have different associations with achievement. The results indicate that both measures generate approximately the same association: an increase of one dollar in either is associated with .001 improvement in achievement. Both measures also show no influence in upstate metropolitan school districts.

High concentrations of minority students tend to be associated with lower achievement scores in all analyses. As indicated above this may be reflecting a myriad of different influences. It is not possible to duplicate the analysis of Summers and Wolfe, who determined that the independent effect of race on achievement growth disappeared when permitted to interact with school inputs. Since achievement levels -- rather than achievement growth, and just third grade achievement -- are being investigated here, the negative association may be reflecting differences in home resources relative to the average. For instance, the correlation between percent minority and students for whom English is a second language and percent below poverty income are .50 and .55 respectively. Perhaps, the most interesting facet is that the correlation between percent minority and New York City is .76. This extremely high correlation suggests that percent minority is reflecting the whole realm of problems facing New York City.

The other school quality measures, size of the school and the pupil-teacher ratio generate less reliable associations. Greater numbers of pupils per teacher are expected to be associated with lower test scores, but the opposite is true for many of the analyses. In a number of them, no statistical reliability can be assigned to the association. The same holds true for the size of the school. For some schools the association is negative, for others it is positive. For rural schools, which average 394 students, the association is positive and statistically reliable. For downstate schools, which average 647 students, the relationship is negative and statistically reliable. This could lead to the suggestion that, isolated from all other factors, the most effective school size is somewhere between these two values.

The measures of socioeconomic status perform as expected for most estimates. Also, they tend to be the variable with the most influence on the achievement score. For example, an increase of one year in the median years of schooling of the population is associated with a change in test score of 1.237 points. Furthermore, approximately one half of the mean reading score and the mean math score is attributable to this factor. Percent poverty also has a strong association such that test scores change by approximately .250 points with a one percent change in the poverty population.

Factors are included in the statewide sample of schools to reflect the location of the school either in New York City, upstate central cities, suburban areas or rural areas. These factors are included to pick up any systematic variation among the schools due to location. After accounting for the other factors mentioned above --

such as socioeconomic status -- no variation in the reading achievement can be attributed to location in New York City relative to a suburban location. However, negative variations in average reading scores can be attributed to location in upstate central city schools and rural schools relative to suburban schools. The findings for math achievement are similar for rural and upstate central city schools. Moreover, some negative variation can be associated with location in New York City relative to suburban schools. The magnitude of the association, after holding all other things constant, is that average math achievement in New York City schools is 1.740 points lower than in suburban schools.

Another interesting finding is that in the upstate metropolitan schools, no systematic variation in reading achievement is due to the school's location in a central city relative to a suburb after accounting for all other factors. Conversely, there is a negative association for math achievement with location in an upstate central city. The magnitude of this variation is a negative one point, a difference of 2.9 percent.

Rural Schools

Rural schools appear to differ from other school groups and also from the state sample of schools, of which some are rural. Some of the differences have been referred to earlier. The most dramatic is that median years of schooling, which is the most important determinant of achievement in most of the other samples, has no association with either math or reading achievement in rural schools -- even though its value is almost the same as the statewide sample.[7]

Furthermore, percent below poverty has almost no impact on math achievement. Achievement levels for rural schools are slightly higher than the statewide average (30.55 and 33.15 for reading and math, respectively, for rural schools; they are 30.05 and 32.91 statewide). But average experience of teachers is over one year less, real expenditures per pupil are nine percent less, instructional expenditures are six percent less and the percent below poverty is two percent greater than the statewide average (see Table 4).

Another point of interest is that the factors included in the analyses explain a relatively small percent of the variation in achievement among schools. Approximately 15 percent of the variation in achievement among rural schools is explained by these factors, whereas the corresponding figures for the state sample, downstate group and upstate metropolitan area are approximately 68 percent, 80 percent and 46 percent, respectively. It is obvious that the rural schools are fairly successful, but the success cannot be explained by this analysis. Perhaps a more thorough and thoughtful study of rural schools should be undertaken.[8]

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[7]The variation in median years of schooling for rural schools is somewhat less than it is for the statewide average. Based on our sample of schools, 67 percent of the population in rural schools have between 11.5 and 12.4 years of schooling whereas the corresponding equal percentage for the state as a whole is 11.4 and 12.7 years of schooling. Though the variation is less, it should not have led to nonsignificance, especially in light of the consistency of results in other samples.

[8]Explained variation is listed on the tables in the Appendix in the row with the heading R^2.

Table 4

MEAN VALUES OF VARIABLES USED IN
THE ANALYSIS BY SCHOOL GEOGRAPHICAL GROUP

School Group	State Sample Schools	Rural Schools	Downstate Schools	Upstate Noncity Schools	Upstate Metro Schools
VARIABLES					
Achievement Scores:					
Third Grade Reading	30.05	30.55	28.57	31.65	31.63
Third Grade Math	32.91	33.15	31.28	34.59	34.68
Teacher Characteristics:					
Average Experience	9.23	7.71	10.45	8.23	8.68
Percent MA or Greater	54.47	38.80	69.46	41.53	43.64
School Characteristics:					
Percent Minority	21.09	4.85	38.30	3.96	8.28
Size	541	394	647	450	481
Pupil-Teacher Ratio	22.10	21.66	22.24	21.19	22.24
Approved Expenditures:					
Log(e) Per Pupil	7.61	7.43	7.77	7.46	7.49
Nominal Per Pupil	2,064	1,692	2,400	1,746	1,809
Real Per Pupil	2,018	1,842	2,172	1,864	1,894
Instruction Expenditures:					
Nominal Per Pupil	1,455	1,231	1,663	1,263	1,299
Real Per Pupil	1,427	1,340	1,510	1,348	1,360
Socioeconomic Status:					
Median Years Schooling	12.08	11.99	12.06	12.12	12.12
Percent Below Poverty	6.85	8.87	7.21	6.54	5.61

Downstate Schools

The most interesting feature of the analyses of downstate schools is the dichotomy between the suburban schools and the New York City schools. Of the 680 schools included in the analyses, 296 are in New York City. The New York City variable has a strong negative association. This probably is because this variable is measuring the concentration of poverty in New York City. For instance, holding all other factors constant, average reading scores are 1.894 points lower and average math scores are 3.575 points lower

in New York City schools than they are in the surrounding suburban schools. The results for the other factors remain quite similar to what they are for the state sample.

Another interesting feature of the downstate results is the association between size and achievement. In this set of schools, each additional student is associated with an average decline in achievement of .001 points. In rural schools, additional students are associated with increases in achievement. The source of this different direction of association is the original starting point. Table 4 indicates that the average number of students in a downstate school is 647 students, whereas the corresponding figure for rural schools is 394. Increases above 647 students may harm the learning environment by making it more bureaucratic or crowded, whereas decreases below 394 may limit the range of offerings of the school. Thus, these findings raise some implications for the most effective size of school. However, the relative impact on achievement scores is likely to be quite small. For instance, increasing the average number of students to 500 in rural schools would be associated with an improvement in achievement of .01 points.

High Achieving and Low Achieving Schools

The previous discussion has indicated what factors tend to be associated with higher achievement or lower achievement. But in most instances, the net effect of a change in a particular factor has been detailed with the revelation that incremental changes in any of the "alterable" factors would result in a relatively small achievement change. Thus, it has not answered the question of what distinguishes

high achieving schools from low achieving schools.

The average values presented in Table 5 are a rough attempt at addressing this. Low achieving schools are defined as those whose average third grade reading score is less than the state average value minus one standard deviation. Thus, it includes those schools that fall in the bottom 16 percent of reading achievement. The definition for high achieving schools are those in the top 16 percent

Table 5

MEAN VALUES OF VARIABLES USED IN
THE ANALYSIS BY SCHOOL ACHIEVEMENT GROUP

School Group	Low Achieving Schools	High Achieving Schools
VARIABLES		
Achievement Scores:		
Third Grade Reading	19.93	37.41
Third Grade Math	21.83	40.43
Teacher Characteristics:		
Average Experience	9.25	9.69
Percent MA or Greater	65.75	59.00
School Characteristics:		
Percent Minority	85.39	5.16
Size	776	447
Pupil-Teacher Ratio	21.73	20.96
Approved Expenditures:		
Log(e) Per Pupil	7.67	7.73
Nominal Per Pupil	2,140	2,344
Real Per Pupil	1,942	2,289
Instruction Expenditures:		
Nominal Per Pupil	1,377	1,705
Real Per Pupil	1,251	1,668
Socioeconomic Status:		
Median Years Schooling	11.53	12.81
Percent Below Poverty	10.92	3.64

of reading achievement (average reading achievement is greater than the state average plus one standard deviation).

Some of the differences are striking, others are not. The average experience of the staffs are almost identical but the proportion of the teaching staff who have a master's degree or more in the low achieving schools is greater than in the high achieving schools. The percent of the school's enrollment that is minority is 17 times greater and the number of students (size) is 74 percent greater in low achieving schools. Real approved expenditures per pupil are 15 percent less and real instructional expenditures per pupil are 25 percent less in low achieving schools. Given all the possible influences that percent minority may be reflecting, one of the possible conclusions is that low achieving schools are such because fewer resources per pupil are expended on students requiring greater resources to achieve parity. Furthermore, it is important to note that differences also exist for socioeconomic attributes, particularly for percent below poverty.[9]

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[9]Benson (1979) provides the following example.

> "Oakland has been a depressed industrial city for most of the post World War II period. It contains, nevertheless, a prosperous middle and upper middle class. A substantial number of persons in these classes are minority; many have risen in affluence in a very short span of time. Yet, their children do passing well in school, just as if they were 'to the manor born.'....What we suggest is different: reduce the poverty context of the environment and school failure will disappear" (p. 38).

Table 6 reports the results of applying the statewide associations for reading achievement to both low and high achieving schools, e.g., simulating the average achievement of these schools from the statewide associations. The simulation demonstrates that this association underestimates the actual average achievement of high achieving schools by 11 percent and overestimates the actual average achievement of low achieving schools by 7 percent. The implication of this is that there may be different interactions between factors depending upon their original levels. For instance, additional resources devoted to a school consisting of a high proportion of students who live in poverty may not generate the identical change as those same resources applied to a school not having a large proportion of low income students.[10]

Table 6

ACTUAL VERSUS SIMULATED READING ACHIEVEMENT

	Actual	Simulated
High Achieving	37.41	33.27
Low Achieving	19.93	21.34

[10]It is well known that the validity of the magnitude of associations developed through the statistical analysis decreases as one moves away from the average value. This rule does not diminish the importance of the statement above and suggests that separate associations be estimated for the schools in the extremes of the distribution.

Finally, the geographic distribution of high and low achieving schools, which is listed in Table 7, demonstrates the special problems faced by large city schools. Almost 90 percent of the low achieving schools are located in central cities, thereby, confirming the magnitude of the task facing schools located in concentrations of poverty and minority students. Conversely, 87 percent of the high achieving schools are located in the suburbs and only 4 percent are located in central cities. This difference is most striking.

Table 7

GEOGRAPHICAL DISTRIBUTION OF HIGH ACHIEVING AND LOW ACHIEVING SCHOOLS

	High Achieving (156)	Low Achieving (228)
	Percent	Percent
New York City	1	78
Upstate Central Cities	3	11
Suburbs	87	5
Rural	9	6
Upstate	54	18
Downstate	46	82

POLICY IMPLICATIONS

The research results are encouraging and thought provoking. The consistency with theoretical expectations and the finding that resources do make a difference are encouraging. The thought provoking aspects of this research are the associations for rural schools. Both categories of results hold implications for public policy. A discussion of these follows.

- Schools do make a difference. Therefore, a school finance program that distributes additional funds to low spending school districts should lead to a general increase in academic achievement.

The research conclusively demonstrates the association between more experienced teachers, greater real expenditures and higher education achievement. But it also must be kept in mind that additional resources will not turn a low achieving school into a high achieving school overnight. Schools are only one factor in education achievement. The home and community are others and the results also demonstrate the important role played by them. Since the concern of policy makers generally is with schools and their financing, it is necessary to focus on the results for the schools. Further, it is necessary to remember that changes probably will be incremental.

- Rural schools are different or they are doing things differently. Therefore, rural schools need to be the subject of more intensive investigation.

The average achievement in rural schools is slightly

greater than the state average, yet the resources available tend to be less. The model developed here also does not explain as much of the difference among rural schools as it does for other subgroups.

Rural schools seem to be doing more with less. But this finding does not mean that all schools would be better off with less, and other findings have shown that this is not the case. The key feature of this study is that the model, which explains a large percentage of the variation among school achievement for the state as a whole and other subgroups of schools, does not explain much of the variation for rural schools. This means that rural schools are different or are doing things differently and that we do not know what it is or how it is done. Therefore, rural schools need to be the subject of more research, e.g. to get inside that "black box." The research may simply demonstrate that the success of rural schools is due to the stability of the community's population or that much of the difference is due to the economic base of a rural community. These factors are unknown, but need to be determined because all schools can learn from the experience of rural schools.

- Schools may want to identify home factors which are susceptible to influence from the schools since home background, as measured by median years of schooling of the population, is the most important determinant of achievement levels.

Previous research has consistently shown home background (or socioeconomic status of the home) to be an

important variable in determining a child's success in school. In this study median years of schooling in the school district was the most important variable associated with school achievement.

Given its relative importance of this area, schools wishing to improve achievement scores may be able to do so by working with the resources in the home. Possible activities might include increasing contact with the home through home visits, parent meetings, or school newsletters. Other methods might be parent education programs or parent participation in school activities. This variable also may be partially measuring a general level of community interest in schools or commitment to education. A fruitful direction for future investigation might be the interaction of community interest with such things as teacher morale, funding levels and student attitudes.

- Although race is associated with low achievement levels, other studies have demonstrated that minority students tend to display the same growth in achievement and to respond to cues in the same way as other students. Therefore school systems should focus on those factors most successful in improving test scores for minority students.

This is an important area for future research efforts. Meanwhile, research has indicated a number of factors which are successful in the education of minority students in addition to some of the consistent patterns across races. A few will be described here.

1. Teacher Characteristics:
    a. Experience: Low achieving students had higher test scores with less experienced teachers (Summers and Wolfe, 1977). Teacher effectiveness reaches a peak between three and five years of experience (Murnane, 1975).
    b. Sex: Male teachers were more effective than females, with stronger impact in math than in reading (Murnane, 1975).
    c. Race: Black teachers were more effective with black children than were white teachers (Murnane, 1975).
2. Class Size: Low achieving students did better in classes of fewer than 28 students (Summers and Wolfe, 1977).
3. School Size: Smaller schools had larger beneficial effects for low achievers than for others. (The median school size was 917 students) (Summers and Wolfe, 1977).
4. Race: Schools which were 40 to 60 percent black appeared to be the most conducive to achievement (Summers and Wolfe, 1977).

Therefore, rather than being discouraged by the consistent negative association, efforts should be made to concentrate on what works. As indicated by Summers and Wolfe, the negative association with achievement disappears when race interacts with the level of school inputs.

APPENDIX

Table A-1

ASSOCIATIONS WITH THIRD GRADE READING ACHIEVEMENT,
STATE SAMPLE OF SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Reading Score	Average Reading Score	Average Reading Score	Average Reading Score
VARIABLES				
Intercept	15.492	2.091	16.792	16.315
Teacher Characteristics:				
Average Experience	.158 (4.413)			
Percent MA or Greater	.010 (1.800)			
School Characteristics:				
Percent Minority	-.102(25.990)	-.104(24.820)	-.103(25.352)	-.100(26.145)
Size	-.001(1.320)	-.000(.619)	-.000(.594)	-.000(.215)
Pupil-Teacher Ratio	.082(3.159)	.097(3.683)	.100(3.803)	.108(4.049)
Approved Expenditures:				
Log(e) Per Pupil		2.177(3.911)		
Nominal Per Pupil			.001(4.118)	
Real Per Pupil				.001(3.763)
Instruction Expenditures:				
Nominal Per Pupil				
Real Per Pupil				
Socioeconomic Status:				
Median Years Schooling	1.237(6.034)	1.099(5.230)	1.072(5.079)	1.062(4.983)
Percent Below Poverty	-.257(6.237)	-.249(5.848)	-.252(5.960)	-.265(6.370)
R^2	.6898	.6852	.6857	.6848
Sample Size	1021	1021	1021	1021
S.E.E.	2.9942	3.0149	3.0125	3.0166

Table A-2

ASSOCIATIONS WITH THIRD GRADE READING ACHIEVEMENT,
STATE SAMPLE OF SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Reading Score	Average Reading Score	Average Reading Score	Average Reading Score
VARIABLES				
Intercept	16.198	16.095	14.612	3.644
Teacher Characteristics:				
Average Experience			.159(4.348)	
Percent MA or Greater			.010(1.717)	
School Characteristics:				
Percent Minority	-.100(25.947)	-.097(26.201)	-.099(20.593)	-.105(21.089)
Size	-.000(.484)	-.000(.385)	-.001(1.643)	-.001(1.291)
Pupil-Teacher Ratio	.102(3.854)	.103(3.815)	.092(3.381)	.096(3.470)
Approved Expenditures:				
Log(e) Per Pupil				1.939(3.278)
Nominal Per Pupil				
Real Per Pupil				
Instruction Expenditures:				
Nominal Per Pupil	.001(3.328)			
Real Per Pupil		.001(2.549)		
Socioeconomic Status:				
Median Years Schooling	1.167(5.608)	1.201(5.764)	1.278(6.134)	1.130(5.269)
Percent Below Poverty	-.257(-5.999)	-.276(6.576)	-.187(3.183)	-.214(3.669)
Regional Characteristics:				
New York City Schools			-.649(1.108)	-.003(.006)
Upstate City Schools			-1.374(2.820)	-1.179(2.421)
Suburban Schools			------	------
Rural Schools			-.544(1.652)	-.502(-1.500)
R^2	.6839	.6825	.6925	.6880
Sample Size	1021	1021	1021	1021
S.E.E.	3.0211	3.0279	2.9857	3.0060

Table A-3

ASSOCIATIONS WITH THIRD GRADE READING ACHIEVEMENT,
RURAL SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Reading Score	Average Reading Score	Average Reading Score
VARIABLES			
Intercept	28.608	29.093	30.834
Teacher Characteristics:			
Average Experience	.209(2.295)		
Percent MA or Greater	-.001(.100)		
School Characteristics:			
Percent Minority	-.093(5.400)	-.097(5.631)	-.094(5.538)
Size	.001(1.361)	.002(2.257)	.002(2.396)
Pupil-Teacher Ratio	.033(.638)	.059(1.121)	.060(1.147)
Approved Expenditures:			
Log(e) Per Pupil			
Nominal Per Pupil			
Real Per Pupil		.002(2.115)	
Instruction Expenditures:			
Nominal Per Pupil			
Real Per Pupil			.003(2.365)
Socioeconomic Status:			
Median Years Schooling	.094(.165)	-.244(.423)	-.397(.675)
Percent Below Poverty	-.174(1.734)	-.198(2.035)	-.205(2.116)
R^2	.1496	.1470	.1503
Sample Size	291	291	291
S.E.E.	3.3975	3.3967	3.3901

Table A-4

ASSOCIATIONS TO THIRD GRADE READING ACHIEVEMENT,
DOWNSTATE SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Reading Score	Average Reading Score	Average Reading Score
VARIABLES			
Intercept	8.371	11.609	12.127
Teacher Characteristics:			
Average Experience	.106(2.571)		
Percent MA or Greater	.022(2.339)		
School Characteristics:			
Percent Minority	-.096(20.124)	-.098(20.523)	-.097(20.319)
Size	-.001(3.176)	-.001(2.969)	-.001(3.262)
Pupil-Teacher Ratio	.172(4.636)	.208(5.436)	.201(5.213)
Approved Expenditures:			
Log(e) Per Pupil			
Nominal Per Pupil			
Real Per Pupil		.001(3.223)	
Instruction Expenditures:			
Nominal Per Pupil			
Real Per Pupil			.001(2.564)
Socioeconomic Status:			
Median Years Schooling	1.636(6.503)	1.303(4.922)	1.441(5.843)
Percent Below Poverty	-.083(.714)	-.168(1.523)	-.285(4.681)
Regional Characteristics:			
New York City Schools	-1.894(2.296)	-.959(1.282)	
Downstate Schools	------	------	
R^2	.8037	.8033	.8020
Sample Size	680	680	680
S.E.E.	2.8946	2.8949	2.9027

Table A-5

ASSOCIATIONS WITH THIRD GRADE READING ACHIEVEMENT,
UPSTATE NONCITY SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Reading Score	Average Reading Score	Average Reading Score
VARIABLES			
Intercept	12.933	14.007	14.883
Teacher Characteristics:			
Average Experience	.159(3.199)		
Percent MA or Greater	.003(.393)		
School Characteristics:			
Percent Minority	.079(6.428)	-.083(6.621)	-.083(6.713)
Size	.000(.790)	.001(1.486)	.001(1.912)
Pupil-Teacher Ratio	-.015(.457)	-.008(.232)	-.006(.164)
Approved Expenditures:			
Log(e) Per Pupil			
Nominal Per Pupil			
Real Per Pupil		.001(1.968)	
Instruction Expenditures:			
Nominal Per Pupil			
Real Per Pupil			.002(2.574)
Socioeconomic Status:			
Median Years Schooling	1.593(5.761)	1.404(4.909)	1.285(4.662)
Percent Below Poverty	-.220(3.630)	-.235(3.951)	-.272(5.721)
Regional Characteristics:			
Rural Schools	-.329(1.084)	-.364(1.197)	
Upstate Schools	------	------	
R^2	.2612	.2537	.2552
Sample Size	737	737	737
S.E.E.	3.0703	3.0837	3.0785

Table A-6

ASSOCIATIONS WITH THIRD GRADE READING ACHIEVEMENT,
UPSTATE METRO SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Reading Score	Average Reading Score	Average Reading Score
VARIABLES			
Intercept	11.741	14.976	15.110
Teacher Characteristics:			
Average Experience	.215(3.893)		
Percent MA or Greater	-.002(.315)		
School Characteristics:			
Percent Minority	-.068(7.417)	-.075(7.660)	-.076(9.319)
Size	-.001(.818)	-.001(.790)	-.001(.706)
Pupil-Teacher Ratio	.041(.965)	.025(.576)	.023(.548)
Approved Expenditures:			
Log(e) Per Pupil			
Nominal Per Pupil			
Real Per Pupil		.000(.312)	
Instruction Expenditures:			
Nominal Per Pupil			
Real Per Pupil			.000(.407)
Socioeconomic Status:			
Median Years Schooling	1.659(5.487)	1.546(4.989)	1.529(5.006)
Percent Below Poverty	-.349(4.567)	-.387(4.904)	-.393(5.507)
Regional Characteristics:			
Upstate City Schools	-.588(1.087)	-.150(.279)	
Upstate Schools	------	------	
R^2	.4687	.4530	.4530
Sample Size	526	526	526
S.E.E.	2.9891	3.0300	3.0270

Table A-7

ASSOCIATIONS WITH THIRD GRADE MATHEMATICS ACHIEVEMENT,
STATE SAMPLE OF SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Mathematics Score	Average Mathematics Score	Average Mathematics Score	Average Mathematics Score
VARIABLES				
Intercept	16.991	-4.500	18.500	17.690
Teacher Characteristics:				
Average Experience	.189(4.565)			
Percent MA or Greater	.014(2.284)			
School Characteristics:				
Percent Minority	-.109(24.053)	-.114(23.552)	-.112(23.876)	-.108(24.546)
Size	-.001(1.964)	-.000(1.093)	-.000(1.075)	-.000(.483)
Pupil-Teacher Ratio	.102(3.395)	1.23(4.073)	.128(4.205)	.144(4.664)
Approved Expenditures:				
Log(e) Per Pupil		3.406(5.297)		
Nominal Per Pupil			.002(5.318)	
Real Per Pupil				.002(5.447)
Instruction Expenditures:				
Nominal Per Pupil				
Real Per Pupil				
Socioeconomic Status:				
Median Years Schooling	1.351(5.684)	1.130(4.657)	1.703(4.522)	1.050(4.268)
Percent Below Poverty	-.350(7.328)	-.326(6.618)	-.333(6.825)	-.347(7.227)
R^2	.6776	.6752	.6752	.6757
Sample Size	1021	1021	1021	1021
S.E.E.	3.4704	3.4819	3.4815	3.4792

Table A-8

ASSOCIATIONS WITH THIRD GRADE MATHEMATICS ACHIEVEMENT,
STATE SAMPLE OF SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Mathematics Score	Average Mathematics Score	Average Mathematics Score	Average Mathematics Score
VARIABLES				
Intercept	17.487	17.099	14.279	-5.799
Teacher Characteristics:				
Average Experience			.201(4.743)	
Percent MA or Greater			.018(2.742)	
School Characteristics:				
Percent Minority	-.108(24.285)	-.103(24.202)	-.103(18.439)	-.111(19.385)
Size	-.000(.867)	-.000(.607)	-.001(1.793)	-.001(1.159)
Pupil-Teacher Ratio	.134(4.375)	.139(4.476)	.124(3.922)	.133(4.165)
Approved Expenditures:				
Log(e) Per Pupil				3.374(4.929)
Nominal Per Pupil				
Real Per Pupil				
Instruction Expenditures:				
Nominal Per Pupil	.002(4.844)			
Real Per Pupil		.002(4.322)		
Socioeconomic Status:				
Median Years Schooling	1.222(5.083)	1.256(5.219)	1.461(6.052)	1.217(4.901)
Percent Below Poverty	-.332(6.720)	-.357(7.377)	-.208(3.060)	-.236(3.491)
Regional Characteristics:				
New York City Schools			-1.740(2.565)	-.888(1.401)
Upstate City Schools			-1.171(2.075)	-.923(1.638)
Suburban Schools			------	------
Rural Schools			-.842(2.206)	-.724(1.869)
R^2	.6737	.6722	.6804	.6804
Sample Size	1021	1021	1021	1021
S.E.E.	3.4896	3.4977	3.4603	3.4063

Table A-9

ASSOCIATIONS WITH THIRD GRADE MATHEMATICS ACHIEVEMENT,
RURAL SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Mathematics Score	Average Mathematics Score	Average Mathematics Score
VARIABLES			
Intercept	24.120	24.304	26.359
Teacher Characteristics:			
Average Experience	.210(2.144)		
Percent MA or Greater	.005(.424)		
School Characteristics:			
Percent Minority	-.096(5.212)	-.101(5.483)	-.098(5.458)
Size	.001(.501)	.002(1.474)	.002(1.866)
Pupil-Teacher Ratio	.079(1.435)	.109(1.955)	.118(2.130)
Approved Expenditures:			
Log(e) Per Pupil			
Nominal Per Pupil			
Real Per Pupil		.003(2.543)	
Instruction Expenditures:			
Nominal Per Pupil			
Real Per Pupil			.005(3.499)
Socioeconomic Status:			
Median Years Schooling	.581(.951)	.180(.292)	-.126(.202)
Percent Below Poverty	-.135(1.252)	-.171(1.642)	-.182(1.764)
Regional Characteristics:			
R^2	.1445	.1483	.1649
Sample Size	291	291	291
S.E.E.	3.6509	3.6364	3.6008

Table A-10

ASSOCIATIONS WITH THIRD GRADE MATHEMATICS ACHIEVEMENT,
DOWNSTATE SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Mathematics Score	Average Mathematics Score	Average Mathematics Score
VARIABLES			
Intercept	5.816	10.944	12.480
Teacher Characteristics:			
Average Experience	.217(4.397)		
Percent MA or Greater	.022(1.983)		
School Characteristics:			
Percent Minority	-.110(19.224)	-.111(19.719)	-.111(19.383)
Size	-.001(2.821)	-.001(2.636)	-.002(4.798)
Pupil-Teacher Ratio	.159(3.601)	.234(5.144)	.220(4.798)
Approved Expenditures:			
Log(e) Per Pupil			
Nominal Per Pupil			
Real Per Pupil		.002(5.198)	
Instruction Expenditures:			
Nominal Per Pupil			
Real Per Pupil			.002(4.333)
Socioeconomic Status:			
Median Years Schooling	2.001(6.677)	1.334(4.249)	1.557(5.293)
Percent Below Poverty	.093(.672)	-.027(.203)	-.301(4.148)
Regional Characteristics:			
New York City Schools	-3.575(3.638)	-2.262(2.550)	
Downstate Schools	------	------	
R^2	.7922	.7936	.7900
Sample Size	680	680	680
S.E.E.	3.4472	3.4334	3.4609

Table A-11

ASSOCIATIONS WITH THIRD GRADE MATHEMATICS ACHIEVEMENT,
UPSTATE NONCITY SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Mathematics Score	Average Mathematics Score	Average Mathematics Score
VARIABLES			
Intercept	14.144	.2724	16.274
Teacher Characteristics:			
Average Experience	.115(2.088)		
Percent MA or Greater	.009(1.207)		
School Characteristics:			
Percent Minority	-.075(5.468)	-.080(5.773)	-.080(5.842)
Size	-.000(.560)	.000(.391)	.001(.941)
Pupil-Teacher Ratio	.016(.432)	.031(.827)	.032(.847)
Approved Expenditures:			
Log(e) Per Pupil			
Nominal Per Pupil			
Real Per Pupil		.002(2.666)	
Instruction Expenditures:			
Nominal Per Pupil			
Real Per Pupil			.003(3.220)
Socioeconomic Status:			
Median Years Schooling	1.759(5.741)	1.521(4.826)	1.323(4.346)
Percent Below Poverty	-.274(4.086)	-.284(4.336)	-.362(6.879)
Regional Characteristics:			
Rural Schools	-.704(-2.091)	-.716(-2.135)	
Upstate Schools	------	------	
R^2	.2723	.2724	.2714
Sample Size	737	737	737
S.E.E.	3.4016	3.3991	3.3989

Table A-12

ASSOCIATIONS WITH THIRD GRADE MATHEMATICS ACHIEVEMENT,
UPSTATE METRO SCHOOLS
(t-scores are in parentheses)

Achievement Measure	Average Mathematics Score	Average Mathematics Score	Average Mathematics Score
VARIABLES			
Intercept	13.246	14.823	17.092
Teacher Characteristics:			
Average Experience	.124(2.047)		
Percent MA or Greater	.011(1.312)		
School Characteristics:			
Percent Minority	-.066(6.523)	-.073(6.796)	-.075(8.363)
Size	-.001(1.735)	-.001(1.426)	-.001(-.651)
Pupil-Teacher Ratio	.058(1.256)	.049(1.033)	.031(.671)
Approved Expenditures:			
Log(e) Per Pupil			
Nominal Per Pupil			
Real Per Pupil		.001(.763)	
Instruction Expenditures:			
Nominal Per Pupil			
Real Per Pupil			-.000(.207)
Socioeconomic Status:			
Median Years Schooling	1.827(5.492)	1.751(5.179)	1.755(5.256)
Percent Below Poverty	-.400(4.764)	-.433(5.023)	-.493(5.312)
Regional Characteristics:			
Upstate City Schools	-1.014(1.702)	-.662(1.126)	
Upstate Schools	------	------	
R^2	.4654	.4585	.4569
Sample Size	526	526	526
S.E.E.	3.2893	3.372	3.3089

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